

The Direct and Indirect Effects of Cost-Sharing on the Use of Preventive Services

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Objective. To test empirically a model for estimating the direct and indirect effects of different forms of cost-sharing on the utilization of recommended clinical preventive services.

Data Sources/Settings. Stratified random sample of 10,872 employees, 18–64 years, who had belonged to their plan for at least one year, from seven large companies that were members of the Pacific Business Group on Health (PBGH) in 1994.

Data Collection. The 1994 PBGH Health Plan Value Check Survey. 1994 PBGH data on requirements for employee out-of-pocket patient cost-sharing for 52 different health plans.

Design. Five equations were derived to estimate the direct and indirect effects of two forms of cost-sharing (copayments and coinsurance/deductibles) in two forms of managed care (HMOs and PPO/indemnity plans) on four clinical preventive services: mammography screening, cervical cancer screening, blood pressure screening, and preventive counseling. Probit models were used to estimate elasticities for the indirect and direct effects.

Principal Findings. Both forms of cost-sharing in both plan types had negative and significant indirect effects on preventive counseling (from –1 percent to –7 percent). The direct effect of cost-sharing was negative for preventive counseling (–5 percent to –9 percent) and Pap smears (from –3 percent to –9 percent) in both HMOs and PPOs, and for mammography only in PPOs (–3 percent to –9 percent). The results of the effects on blood pressure screening are inconclusive.

Conclusions. Both the direct and indirect effects of cost-sharing negatively affected the receipt of preventive counseling in HMOs and PPOs. As predicted, the direct negative effect of cost-sharing was greater than the indirect effect for Pap smears and mammography. Eliminating cost-sharing for these services may be important to increasing their utilization to recommended levels.

Key Words. Health insurance, preventive services, cost-sharing, coinsurance, deductibles, copayments, mammography, Pap smear, blood pressure, health education, managed care

The use of preventive services can be conceptualized as occurring through one of two processes. An individual can receive preventive care as a result of actively seeking it or as a result of visiting a physician for other medical care needs. Thus, cost-sharing for outpatient services can affect the use of preventive services directly and indirectly (Solanki 1996). The direct effect occurs when increased cost-sharing reduces the probability that an individual will seek a specific preventive service. The indirect effect occurs when increased cost-sharing decreases the probability that an individual will make an office visit, thus reducing the probability of receiving blood pressure screening, preventive counseling, or other preventive services customarily provided as part of routine primary care.

Referrals for specific preventive services, such as mammograms, are also made during office visits. For services requiring a referral and a separate visit, cost-sharing has both direct and indirect effects. The direct effect is expected to be more important for services requiring referrals since cost-sharing for the separate visit directly affects its price. For Pap smears, the relative importance of the direct and indirect effects of cost-sharing may vary depending on whether this service is provided by the primary care provider or requires a separate visit to an obstetrician/gynecologist. Thus, the relative importance of each effect can be expected to depend on the type of service and how it is delivered.

Effects of cost-sharing on the use of preventive services is not well understood. This is notable in light of the pervasiveness of cost-sharing in both public and private health insurance and managed care plans, and the demonstrated impact of cost-sharing on the use of curative and other healthcare services (Beck and Horne 1980; Brian and Gibbons 1974; Cherkin, Grothaus, and Wagner 1989; Group Health Association of America 1994; Lohr, Brook, Kamberg, et al. 1986; Newhouse, Manning, Morris, et al. 1981; Roddy, Wallen, and Meyers 1986; Rice and Morrison 1994; Schauffler and Rodriguez 1993; Faulkner and Schauffler 1997; Scitovsky and Synder 1972). Understanding the effects of patient cost-sharing on the use of preventive services is important for promoting the appropriate use of these services.

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The aim of this research is to empirically test and estimate a model for predicting the direct and indirect effects of different forms of cost-sharing by patients on the utilization of recommended clinical preventive services (U.S. Preventive Services Task Force 1996).

METHODS

Data

Data for this research were collected by the Pacific Business Group on Health (PBGH), a coalition of large employers in California. From 1993 through 1997, PBGH conducted an annual random sample survey of the employees of member companies, called the Health Plan Value Check (HPVC), as part of its quality assessment program. The 1994 HPVC consisted of 78 structured questions in key areas of preventive care utilization (screening and counseling services), office visits, health status, health plan satisfaction and sociodemographic characteristics of the employees. PBGH identified the receipt of recommended clinical preventive services as a key quality indicator as early as 1991, prior to the release of the Health Plan Employer Data and Information Set (HEDIS 2.0). However, in 1993, the year in which PBGH first requested Pap smear and mammography data from the plans, the quality of the data provided by the plans was very poor (e.g., reported screening rates ranged from less than 5 percent to over 95 percent). Because PBGH recognized that simply requiring health plans to provide data on preventive services utilization did not ensure the availability of comparable or reliable data, PBGH relied for years on the HPVC as the most reliable source of preventive services utilization data.

For the 1994 HPVC, a random sample of employees and retirees at each of seven companies was selected from each health plan offered by the seven participating employers using a sampling technique stratified by plan. A sampling frame of all of the health plans offered by the employers was created, and then a proportionate (by size) random sample was selected from each cell. Questionnaires were sent to employees' homes and returned by mail to a third party. A total of 26,536 questionnaires were mailed and 13,350 were returned, for an overall response rate of 50.31 percent.

The analysis sample was restricted to employees who had belonged to their plan for at least one year. The reason for this restriction was that the PBGH member companies believed it to be the responsibility of the plans currently enrolling their employees to bring those employees up to

date on receiving recommended preventive care. The employers were less concerned about where the services had been provided—under the current plan or a previous plan—than about if they had been provided within the recommended time frames. For example, if a woman had been enrolled in her current health plan for only one year but had received a Pap smear two years ago, she would still be considered to have received her recommended Pap smear within the last three years.

The sample was further restricted to non-Medicare respondents and persons from ages 18 through 64 years. The final analysis sample consisted of 10,872 respondents, representing seven employers served by 20 different health insurance companies. Because the seven employers had negotiated their contracts with the insurance plans individually, a total of 52 company-specific plans were offered by these 20 health insurance companies in 1994.

PBGH also collected cost information from each health plan and employer, including the employee and employer health insurance premium contributions and whether out-of-pocket copayments, deductibles, and/or coinsurance were required or not. Data on the level of different forms of cost-sharing (e.g., \$5 versus \$10 copayment; 25 percent versus 30 percent coinsurance; \$250 versus \$500 deductible) were not available.

Major Study Variables

Two forms of health plan cost-sharing were defined: coinsurance/deductibles and copayments. Three health plan types were defined: (1) PPO/Indemnity plans; (2) group model HMOs, where the HMO contracted with one physician group and the physicians in that group provided care exclusively to that HMO's enrollees; and (3) all other HMOs, where the HMO contracted with one or more IPAs, medical groups, or physicians who provided care for patients enrolled in more than one plan. IPAs, network model HMOs, mixed-model HMOs, and point-of-service (POS) plans were combined into one category (mixed HMO/IPA/POS plans).

Use of recommended preventive services was defined in the study as dichotomous variables for Pap smears, mammograms, blood pressure screening, and preventive counseling, based on recommendations for the appropriate population and periodicity from the U.S. Preventive Services Task Force (1996) Guidelines. Receipt of a recommended Pap smear was defined as at least one Pap smear in the last three years for women 18 years and older. Receipt of a recommended mammogram was defined as at least one mammogram in the last two years for women 50 years and older. Receipt of recommended blood pressure screening was defined as at

least one blood pressure reading in the last two years for adults 21 years and older. Receipt of recommended preventive counseling was defined as receiving any preventive counseling by a healthcare provider at least once in the last three years for adults 18 years and older. The counseling services about which respondents were asked included those on exercise, nutrition, smoking, injury prevention, motor vehicle safety, alcohol and substance abuse, and sexually transmitted diseases. A single dichotomous variable was created for preventive counseling. It indicated for each employee if a physician or other health professional had discussed any or none of these topics in the last three years.

Both individual and plan factors were viewed as influences on the utilization of preventive services. Factors that were controlled for in the individual domain included functional status, employee health status, age, gender, education level, family income, and smoking status (current, former, never). Functional health status was measured using an index of the ten instrumental activities of daily living (IADLs). The variable measuring employee health status was created from responses to the question, "How would you describe your current health?" Responses were measured on a 5-point scale from excellent to poor. Factors that were controlled for in the plan domain included type of health plan, type of cost-sharing (copayment, deductible/coinsurance, none), and length of time in current plan (number of years). The descriptive statistics for the variables are presented in Table 1.

Analysis

Five equations were derived to empirically estimate and test the direct and indirect effects of cost-sharing on the utilization of preventive services. Equation 1 is a probit model that estimates the effect of cost-sharing on the propensity of an individual to make an office visit. The probability of an office visit is the cumulative normal distribution function evaluated at the expected propensity, which is a function of the independent variables and the cost-sharing explanatory variables:

$$OV^* = f(ID, PD, CS) \tag{1}$$

where:

- OV^* = the propensity to make an office visit and OV is an indicator for an office visit;
- ID = all of the factors in the individual domain: functional status, health status, age, sex, education, family income;

Table 1: Descriptive Statistics

<i>Variables</i>	<i>N</i>	<i>Percent or Mean (s.d.)</i>
<i>Received Recommended Preventive Care</i>		
Preventive counseling	10,171	58.6%
Blood pressure	10,635	95.0%
Mammogram	1,112	86.3%
Pap smear	4,273	89.9%
<i>Plan Domain</i>		
<i>Health Plan Type</i>	10,872	
PPO/Indemnity		27.0%
Group model HMO		29.0%
IPA/Network		44.0%
HMO/POS		
<i>Cost-Sharing</i>	10,872	
Coinsurance/Deductibles		18.0%
Copayments		62.0%
No cost-sharing		20.0%
<i>Time in Plan</i>	10,872	
1-2 years		28.6%
3-4 years		19.6%
5-6 years		11.4%
> 6 years		40.4%
<i>Individual Domain</i>		
<i>Health Status</i>	10,713	
Excellent		15.6%
Very Good		36.9%
Good		36.9%
Fair		9.2%
Poor		1.3%
<i>Functional Status Index</i>	10,777	28.21 (3.3)
<i>Age</i>	10,872	44.5 (10.2)
<i>Gender</i>	10,872	
Male		59.2%
Female		40.8%
<i>Family Income</i>	10,384	
< \$15K		1.5%
\$15-\$35K		15.4%
\$35-\$55K		28.0%
\$55-\$75K		26.5%
> \$75K		28.6%
<i>Education</i>	10,445	
Some high school		1.0%
High school graduate		11.9%
Some college		35.7%
College graduate		35.7%
Postgraduate		15.7%
<i>Smoking Status</i>	10,629	
Current smoker		11.8%
Former smoker		32.0%
Never smoked		56.2%

PD = the factors in the plan domain: length of time in plan;
and
 CS = an indicator for cost-sharing.

Equation 2 estimates the effect of cost-sharing on the propensity of an individual to use a specific preventive service, controlling for other factors in the plan; the propensity to make an office visit; and individual characteristics. The probit model is again used to describe and estimate the model:

$$S^* = f(ID, PD, \wedge OV^*, CS) \quad (2)$$

Where, in addition to the above notation:

S^* = the propensity to use a specific preventive service and
 S is an indicator for receipt of that specified preventive service; and
 $\wedge OV^*$ = the expected propensity for making an office visit
(predicted from the estimated form of Equation 1).

The probability that an individual uses a particular service is calculated from the estimated forms of Equations 2 and 1. The potential correlation in the error terms in the first and second probits was allowed through the use of a multinomial normal distribution (as opposed to assuming independence).

The direct effect of cost-sharing is its effect on the likelihood that people will use a particular preventive service. The behavioral parameter of interest is the coefficient on the dummy indicator of type of cost-sharing in Equation 2.

$$DE = \Delta \Phi[\wedge S^*] / \Delta CS \quad (3)$$

Where:

DE = the direct effect of cost-sharing; and
 $\Delta \Phi[\wedge S^*] / \Delta CS$ = the change (Δ) in expected probability of receiving a preventive service when an individual belongs to a health plan with cost-sharing, compared to the expected probability when the individual belongs to a plan without cost-sharing.

The indirect effect of cost-sharing is the effect of cost-sharing on the propensity to have an office visit and, in turn, the effect of this change in the propensity to have an office visit on the likelihood that the individual will use a particular preventive service. The first of these effects focuses on the behavioral parameter on the dummy indicator of type of cost-sharing in

Equation 1; the second focuses on the behavioral parameter on the dummy indicator of type of cost-sharing in Equation 2. The indirect effect (*ID*) of cost-sharing on the use of a preventive service is then given by:

$$IDE = \Delta \Phi[\wedge S^*] / \Delta OV^* \times \Delta OV^* / \Delta CS \quad (4)$$

where:

IDE = the indirect effect of cost-sharing; and

$\Delta \Phi[\wedge S^*] / \Delta OV^*$ = the change in the probability of receiving a preventive service as a result of a change in the propensity for making an office visit;

$\Delta OV^* / \Delta CS$ = the change in the propensity for making an office visit when an individual belongs to a health plan with cost-sharing compared to when the individual belongs to a plan without cost-sharing.

The total effect of any particular form of cost-sharing on the use of a particular preventive service is the sum of its direct and indirect effects.

These effects are traditionally expressed as elasticity measures. As an elasticity, the effect of cost-sharing is the product of the change in the probability of utilization due to cost-sharing and the ratio of the average of the dummy variable indicating a particular kind of cost-sharing to the average probability of preventive service utilization.¹ Since the analysis is plan- and preventive service-specific, the average cost-sharing dummy variable is either one or zero. Accordingly, the elasticity of a specific form of cost-sharing on the use of a preventive service is the relative change in the probability that an individual uses the preventive service due to a particular type of cost-sharing.

For each individual, the percentage change in probability was estimated by dividing the change in the probability of use of a service by the probability of an individual's use of a service if no cost-sharing was required. Results are multiplied by 100 and expressed as percentages. Expected direct effect (*DE*) and indirect effect (*IDE*) elasticities were estimated with the average of each individual's estimated value. Ninety-five percent confidence intervals (95% CI) were estimated for the individually estimated elasticities. *DE* and *IDE* were estimated for each of the combinations of cost-sharing and plan type (deductibles/coinsurance in PPO/Indemnity, copayments in PPO/Indemnity, copayments in mixed HMO/IPA/POS plans, copayments in group model HMOs) for each of the four preventive services (counseling, blood pressure screening, Pap smears, and mammograms).

Statistical tests of differences from zero for *DE* and *IDE* elasticities were carried out using a two-tailed test at 95% CI. The statistical significance of the absolute difference in the magnitude of the direct and indirect effects was also determined.

Hypotheses regarding the relative contribution of the direct and indirect effects of cost-sharing on the utilization of each preventive service were tested.

RESULTS

Bivariate Relationships

Table 2 presents the results from the bivariate analysis of the utilization rates for each of the preventive services in each of the cost-sharing/plan type combinations for adults with and without cost-sharing. The table also shows the percentage of enrollees in each plan type that had cost-sharing requirements for each of the preventive services. The results indicate that cost-sharing was associated with a lower use of preventive services for all forms of cost-sharing in all plan types for preventive counseling, Pap smears, and mammograms.

The rates of blood pressure screening use were lower for individuals in PPO/Indemnity plans with deductibles/coinsurance and copays compared to the use rates for persons enrolled in plans with no cost-sharing, and fewer of those with copays had blood pressure screening than those with no cost-sharing in group model HMOs. Rates of blood pressure screening were less than one percent higher for those without cost-sharing than for those with copayments in mixed HMO/IPA/POS plans.

The differences in utilization rates for preventive counseling for those with and without cost-sharing were the greatest; the rates ranged from more than 14 percentage points for persons in PPO/Indemnity plans to 0.5 percentage points for those in group HMOs. The differences in utilization rates were lowest for blood pressure screening between individuals with and without cost-sharing in their plans, with a difference of under 4 percentage points in the rate of utilization between PPO/Indemnity and group HMO plans. The differences in utilization rates for Pap smears for those with and without cost-sharing ranged from 8.2 percentage points in PPO/Indemnity plans with coinsurance and deductibles to 4 percentage points in group HMOs. For mammography screening, the differences ranged from 9.4 percentage points in mixed HMO/IPA/POS plans to 3.9 percent for copays in PPO/Indemnity plans.

Table 2: Bivariate Relationships of Cost-Sharing and Preventive Services Use by Health Plan Type and Form of Cost-Sharing

<i>Health Plan Type Cost-Sharing</i>	<i>Percent with Cost-Sharing for Preventive Care</i>	<i>Percent Receiving Preventive Service WITH Cost-Sharing</i>	<i>Percent Receiving Preventive Service WITH NO Cost-Sharing</i>
<i>PPO/Indemnity</i>			
<i>Deductible/Coinsurance</i>			
Counseling (<i>n</i> = 1,996)	84.3%	52.5%	66.8%
Blood pressure (<i>n</i> = 2,099)	84.4	92.4	96.3
Pap smears (<i>n</i> = 670)	85.5	84.5	92.7
Mammograms (<i>n</i> = 234)	81.2	78.4	86.4
<i>PPO/Indemnity Copay</i>			
Counseling (<i>n</i> = 777)	59.7	52.2	66.8
Blood pressure (<i>n</i> = 817)	59.8	95.3	96.3
Pap smears (<i>n</i> = 225)	57.3	89.9	92.7
Mammograms (<i>n</i> = 88)	45.5	82.5	86.4
<i>Group Model HMO</i>			
<i>Copay</i>			
Counseling (<i>n</i> = 2,709)	64.9	63.4	63.9
Blood pressure (<i>n</i> = 2,833)	65.6	93.2	96.8
Pap smears (<i>n</i> = 1,376)	77.7	88.2	92.2
Mammograms (<i>n</i> = 352)	80.4	89.4	97.1
<i>Mixed/IPA/POS</i>			
<i>Copay</i>			
Counseling (<i>n</i> = 4,135)	84.9	57.6	63.1
Blood pressure (<i>n</i> = 4,281)	84.9	96.5	95.7
Pap smears (<i>n</i> = 1,759)	88.4	91.7	97.1
Mammograms (<i>n</i> = 377)	89.7	85.5	94.9

In general, cost-sharing in PPO/Indemnity plans was associated with the greatest differences in utilization rates of preventive services, with copays in group model HMOs associated with the smallest differences in utilization rates of preventive care.

Direct and Indirect Elasticities

The percentage change in the probability of using a preventive service as a result of the direct and indirect effects of cost-sharing estimated from the probit models is presented in Table 3.

Indirect Effects. The indirect effect of cost-sharing on preventive counseling was negative and statistically significant (at the $p < .05$ level) for all

Table 3: Comparison of the Direct and Indirect Effects of Cost-Sharing on Recommended Preventive Services

	N	Indirect Effect (IDE)			Direct Effect (DE)			(IDE-DE)
		Mean	s.d.	(95% CI)	Mean	s.d.	(95% CI)	
<i>Counseling</i>								
Coinsurance/Deductible:	2460	-7.3%	2.2%	(-11.60% - -3.06%)*	-7.5%	2.0%	(-11.39% - -3.58%)*	0.2% DE 0.959
PPO/Indemnity								
Copay: PPO/Indemnity	2460	-5.9%	1.6%	(-9.10% - -2.68%)*	-9.1%	2.4%	(-13.79% - -4.45%)*	3.2% DE 0.265
Copay: group model HMO	2709	-1.8%	0.4%	(-2.60% - -0.92%)*	0.9%	0.2%	(0.46% - 1.33%)*	2.7% IDE 0.000*
Copay: mixed HMO/IPA/POS	4135	-0.9%	0.2%	(-1.34% - -0.39%)*	-5.3%	1.3%	(-7.85% - -2.76%)*	4.4% DE 0.001*
<i>Blood Pressure</i>								
Coinsurance/Deductible:	2588	-2.7%	1.6%	(-5.74% - 0.37%)	0.4%	0.2%	(-0.09% - 0.80%)	3.0% IDE 0.055
PPO/Indemnity								
Copay: PPO/Indemnity	2588	-1.7%	1.4%	(-4.41% - 0.94%)	3.3%	2.1%	(-0.94% - 7.46%)	5.0% IDE 0.051
Copay: group model HMO	2833	-1.6%	1.0%	(-3.63% - 0.34%)	-3.1%	1.5%	(-6.14% - -0.08%)*	1.5% DE 0.430
Copay: mixed HMO/IPA/POS	4281	-0.1%	0.0%	(-0.12% - 0.01%)*	0.9%	0.5%	(-0.01% - 1.85%)	1.0% IDE 0.036*
<i>Pap Smears</i>								
Coinsurance/Deductible:	799	0.8%	0.6%	(-0.42% - 1.98%)	-8.6%	4.3%	(-17.03% - -0.16%)*	9.4% DE 0.032*
PPO/Indemnity								
Copay: PPO/Indemnity	799	0.8%	0.4%	(-0.01% - 1.62%)	-2.5%	1.4%	(-5.20% - -0.14%)	3.3% DE 0.020*
Copay: group model HMO	1376	1.6%	1.0%	(-0.27% - 3.46%)	-5.0%	2.1%	(-9.09% - -1.00%)*	6.6% DE 0.004*
Copay: mixed HMO/IPA/POS	1759	-1.3%	0.9%	(-3.06% - 0.47%)	-3.9%	1.7%	(-7.17% - -0.63%)*	2.6% DE 0.171
<i>Mammograms</i>								
Coinsurance/Deductible:	274	0.9%	0.6%	(-0.22% - 1.95%)	-9.4%	4.3%	(-17.80% - -1.04%)*	10.3% DE 0.018*
PPO/Indemnity								
Copay: PPO/Indemnity	274	0.8%	0.4%	(0.06% - 1.56%)*	-3.4%	1.6%	(-6.57% - -0.22%)*	4.2% DE 0.012*
Copay: group model HMO	352	-0.9%	1.0%	(-2.83% - 1.07%)	-7.3%	4.0%	(-15.03% - 0.46%)	6.4% DE 0.118
Copay: mixed HMO/IPA/POS	377	4.2%	10.0%	(-15.36% - 23.83%)	-14.1%	7.5%	(-28.84% - 0.65%)	18.3% DE 0.145

*Statistically significant at $p < .05$.

combinations of plan type and cost-sharing examined. The magnitude of the effect ranged from -7.3 percent (coinsurance/deductibles in PPO/Indemnity plans) to -0.9 percent (copayments in mixed HMO/IPA/POS plans). For blood pressure screening, only the indirect effect of copayments in mixed HMO/IPA/POS plans was statistically significant (-0.1 percent). The indirect effect on Pap smears was not statistically significant for any of the combinations of plan type and cost-sharing examined. For mammograms, the indirect effect was positive with copayments in PPO/Indemnity plans.

These findings suggest that office visit cost-sharing in both PPO/Indemnity plans and HMO plans had a significant negative effect on the probability that adults would have been counseled about any of their health behaviors in the previous three years. Office visit cost-sharing had little to no effect on the probability that adults had been screened for high blood pressure in the last two years, showing only a small negative effect for persons in mixed-model HMOs, IPAs, and POS plans. In addition, office visit cost-sharing had no negative effects on the probability that women had received Pap smears or mammograms within recommended time frames.

Direct Effects. The direct effect of cost-sharing on preventive counseling was negative and statistically significant for all of the combinations of plan type and cost-sharing except for copayments in group model HMOs. Among the combinations for which the direct effect was negative, its magnitude ranged from -9.1 percent (coinsurance/deductibles in PPO/Indemnity plans) to -5.3 percent (copayments in mixed HMO/IPA/POS plans). The direct effect of cost-sharing on blood pressure screening was significantly negative with copayments for group model HMOs (-3.1 percent), but not statistically significant for any of the other three combinations of plan type and cost-sharing. The direct effect on Pap smears was negative and statistically significant with coinsurance/deductibles in PPO/Indemnity plans (-8.6 percent), and with copayments in group model HMOs (-5.0 percent) and mixed HMO/IPA/POS plans (-3.9 percent). The effect of copayments in PPO/Indemnity plans was negative but not statistically significant (-2.5 percent). The direct effect on mammograms was negative and statistically significant for both coinsurance/deductibles (-9.4 percent) and copayments in PPO/Indemnity plans (-3.4 percent). The direct effect of copayments on mammograms in group model HMOs and mixed HMO/IPA/POS plans was negative but not statistically significant.

These findings suggest that cost-sharing for preventive counseling in all health plans, for Pap smears in HMOs, and for Pap smears and mammograms

in PPOs reduces the probability that adults will receive these recommended preventive services.

Relative Importance of Direct and Indirect Effects. The pattern in the differences between the direct and indirect effects was most consistent with Pap smears and mammograms: the negative impact of the direct effect was greater than the indirect effect for all of the combinations of plan type and cost-sharing examined. For Pap smears, the differences were statistically significant for all of the combinations of plan type and cost-sharing except for copayments in mixed HMO/IPA/POS plans. For mammograms, the differences were statistically significant for both coinsurance/deductibles and copayments in PPO/Indemnity plans.

For preventive counseling, the negative indirect effect of copayments in group model HMOs was significantly greater than the direct effect, while the direct effect of copayments in mixed HMO/IPA/POS plans was significantly greater than the indirect effect. For blood pressure screening, the only significant difference between the direct effect and indirect effect was for copayments in mixed HMO/IPA/POS plans.

LIMITATIONS

The limitations of the research fall into three broad areas: potential selection bias in consumer choice of health plans, potential response bias to the employee survey, and lack of specificity in the level of patient cost-sharing.

Selection Bias in Choosing Health Plans

Selection bias in consumers' choice of health plans raises estimation problems when specifying plan type as an independent variable to control for supply-side characteristics. Rice and Morrison (1994), among others, have argued that the observed relationship between utilization patterns and the plan selected may represent a reverse causality because of the possibility that people may select particular types of plans based on their expectations of utilization. It is thus possible that people who want to make greater (or lesser) use of preventive services may be more likely to select an HMO plan over a PPO plan. We dealt with the potential endogeneity of plan type by deriving estimates for the effects of cost-sharing on use of preventive services within each of the plan types, separately. By doing so, the plan type variable is removed from the right-hand side of the equation.

The problem of selection bias also pertains to the specific health plan selected within a particular type of plan. For employees looking to minimize

their out-of-pocket costs for preventive care, for example, those plans with no or lower cost-sharing may be preferred. Thus, by analyzing the cost-sharing effects within particular plan types, the problem of biased selection is reduced, but not eliminated.

Response Bias

The response rate to the HPVC survey was just above 50 percent. This rate of response has remained relatively constant since PBGH first started conducting its consumer survey in 1993. Previous analysis of potential bias resulting from the response to the HPVC found that women are more likely to respond, as are older employees. Thus, the nonrespondent sample contains a relatively higher proportion of younger men (age-gender bias).

The Bay Area Business Group of Health (BBGH) undertook a study in 1993 to determine the extent of health services utilization differences between respondents and nonrespondents to their surveys (BBGH 1994). The only utilization data that were available for both respondents and nonrespondents were from Kaiser Permanente Northern California, which was offered by all employers participating in the HPVC. The only utilization measure that could be reliably assessed for this purpose was ambulatory visits/member. Few of the health plans in California in the early 1990s were collecting data on preventive services utilization.

Ambulatory visit rates in each of five age-gender cells were used to calculate the expected use rates of respondents and nonrespondents and actual-to-expected ratios. Multiple regression analysis, using age, gender, company, and response as independent variables, was also used to assess the significance of the response bias. Using differences in relative rates of ambulatory visits, responders had a 2 percent overall higher rate of ambulatory visits compared to nonresponders. Percentage ratios by company/employer ranged from -9.5 percent to 18.2 percent. No systematic tendency toward higher or lower use rates, coupled with the low overall differences between responders and nonresponders, led PBGH to conclude that no strong evidence existed to support response bias.

The results of the multiple regression analysis indicated that, after controlling for age and gender, company/employer was a significant predictor of ambulatory visits but that response status (respondent/non-respondent) contributed no added predictive power to the model ($p = .48$). These results do not support a finding of response bias.

A related limitation of the study was the relatively small sample sizes for measuring the effect of cost-sharing on mammograms, which applies only

to women 50 years and older, thus limiting the power of the model and increasing the likelihood of Type II errors for these estimates.

Level of Cost-Sharing

Ideally, it would have been preferable to use the actual copayment amounts and coinsurance rates required by the various plans. This would have resulted in more accurate estimates of the elasticities of demand. However, the available data were inadequate for carrying out such an analysis, and indicator variables had to be used as summary measures. In addition, little variability existed across plans with most copayment rates set at \$5 or \$10 per visit. It would also have been preferable to have measures of the actual amount of preventive services utilized. By using an indicator variable for the receipt of a service (received or not within a specified period of time), this analysis was able to examine the problem of underutilization of preventive services but was not able to make any inferences regarding possible overutilization.

Other Potentially Confounding Variables

Finally, it would have been preferable to include more supply-side variables, such as the method of remuneration to providers, utilization review, established guidelines, and so forth, into the specification of the model. This would have provided more reliable estimates for the independent effect of cost-sharing and would have allowed the influence of these factors on the utilization of preventive services to be examined more closely.

Given the limitations in our sample and study variables, it would be useful to test the models we have estimated on another sample of employees of large firms enrolled in different managed care plans with different patient cost-sharing arrangements for preventive care. This would enable us to fully assess the validity of our findings.

DISCUSSION

An important goal of this research was to determine the relative importance of the different mechanisms/processes through which cost-sharing affects the use of preventive services. We hypothesized that because the provision of preventive counseling and blood pressure screening services is mediated largely through office visits, the indirect effect of cost-sharing would be larger than the direct effect. On the other hand, because Pap smears and

mammograms often require separate visits, we hypothesized that the direct effect of cost-sharing was expected to be larger than the indirect effect.

These hypotheses were largely supported by the findings of a strong direct effect of cost-sharing on Pap smears and mammograms and of the indirect effect of cost-sharing on preventive counseling. For Pap smears and mammograms, the direct effect was greater than the indirect effect for all eight combinations of plan type and cost-sharing examined and was statistically significant for five. The results with regard to preventive counseling, where the negative indirect effect was important, also supported the hypotheses; however, we were surprised that the direct effects of cost-sharing on preventive counseling were as strong, if not stronger in some cases, than the indirect effects. The hypotheses were only partly supported for blood pressure screening, where the indirect effect was found to be stronger than the direct effect for three of the four combinations of plan type and cost-sharing and was statistically significant for only one.

Notably, for Pap smears and mammograms, the indirect effect was positive (i.e., increased use of preventive services occurred as a result of the indirect effect) for three of the combinations of plan type and cost-sharing. An examination of the estimated coefficients for the probit models indicates that, although the relationship between office visits and cost-sharing was negative as expected for all combinations of plan type and cost-sharing, the relationship between an office visit and receipt of the specific preventive service was negative (rather than positive) for those combinations in which the indirect effect was positive. The observed negative relationship between making an office visit and receiving a Pap smear may be partly related to the reliance of primary care physicians on obstetricians and gynecologists to provide this service. However, relative to the direct negative effect, the positive effect was small and the total effect was negative.

In summary, our findings suggest that the direct effect of cost-sharing is most important for Pap smears and mammograms, with both the direct and indirect effects of cost-sharing important for preventive counseling. The results for blood pressure screening showed little impact of cost-sharing.

POLICY IMPLICATIONS

The findings have important policy implications for the reform of cost-sharing policies, as cost-sharing requirements appear to play an important role in the use of recommended preventive services (Schauffler and Rodriguez 1993;

Solanki 1996). Our findings suggest that removing cost-sharing for targeted clinical preventive services may be important to increasing appropriate utilization of recommended preventive care.

The receipt of recommended preventive care by members of licensed HMOs in California in 1997 fell far short of desired levels. Nearly all of the HMOs in California participate in the California Cooperative Healthcare Reporting Initiative (CCHRI) and annually provide audited performance data on utilization of Pap smears, mammograms, and smoking cessation counseling. These performance measures are part of the National Committee on Quality Assurance (NCQA), Health Plan and Employer Data and Information Set (HEDIS) measure set. In 1997, mean rates for mammography screening in California HMOs was only 69 percent (range: 58 percent–72 percent); 67 percent for Pap smears (range 55 percent–82 percent), and 62 percent for smoking cessation counseling (52 percent–71 percent) (PBGH 1997).² Performance varied considerably across health plans and left a great deal of room for improvement in providing these preventive services. Ideally, from a public health perspective, rates of utilization for each of these preventive services should be 100 percent for the targeted populations within the periodicity schedules recommended by the U.S. Preventive Services Task Force.

A 1997 survey of all of the licensed commercial HMOs and PPOs in California found that cost-sharing for preventive care in employer group health insurance products is still quite common (University of California, Berkeley 1997). Of the 29 HMOs reporting, 21 required copayments for an office visit or periodic health exam, 19 required copayments for Pap smears, 14 required copayments for mammograms and Pap smears, and of the 23 HMOs that covered preventive counseling 14 required copayments. Similarly, out of 18 PPO group products offered by commercial health insurers, only 14 covered an office visit for a periodic health exam and eight subjected coverage to deductibles and coinsurance; 18 covered mammography with 12 subjecting coverage to deductibles and coinsurance; 14 covered Pap smears with eight of these subjecting coverage to deductibles and coinsurance; and only six covered preventive counseling with four of them subjecting coverage to deductibles and coinsurance.

Unlike the cost-sharing requirements imposed on members of commercial health plans in California, the Medicaid program, because of the low incomes of its enrollees, has never imposed any cost-sharing requirements for outpatient or preventive care. In addition, in the Balanced Budget Act of 1997 (PL 105-33) the Social Security Act was amended to waive the deductible

(but not the coinsurance) requirements under Medicare for mammograms and Pap smears. However, both coinsurance and deductibles are required for colorectal cancer screening and prostate cancer screening covered under Medicare.

The direct negative effects of all forms of cost-sharing on mammograms and Pap smears and the indirect negative effects of office visit cost-sharing on preventive counseling suggest that the removal of cost-sharing requirements for these preventive services may be one way to increase their appropriate utilization. Not only would increasing utilization rates for preventive care translate into better performance on HEDIS measures and higher quality ratings on report cards for health plans operating in a very competitive marketplace, but it might also help to meet public health goals for preventive care among insured populations.

Frequently, health plans, purchasers, and employees trade off copayment levels against premium costs. In purchasing healthcare on behalf of their employees, employers and purchasing groups may pay slightly more for health insurance plans that waive cost-sharing for office visits for periodic health exams (every three years), Pap smears (every three years), and mammograms (every two years for women 50 years and over). The policy question that remains unanswered is whether or not the added benefit of increasing utilization of these preventive services is worth the additional cost.

Additional research is needed for a full assessment of the validity of cost-sharing effects on preventive care as they were estimated in our model. It would be valuable to test our model on another sample of employees to enhance our conclusions and add credibility to the model results; this could add weight to the potential beneficial effects of health policy decisions regarding cost-sharing for preventive care. Ideally, such research would aim to obtain a response rate of at least 65–70 percent; it would include data on the actual dollar amounts of required copayments and deductibles and the percentage of the costs of preventive care subject to coinsurance, enabling us to estimate more precise elasticities.

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NOTES

1. The elasticity of the direct effect of cost-sharing on the utilization of a preventive service is given by:

$$\eta DE_{sip} = \Delta Pr[S_{sip} = 1] / \Delta CS_{ip} / Pr[S_{sip} = 1] = \Delta \Phi[\wedge S^*] / \Delta CS / \Phi[\wedge S^*],$$

and the elasticity of the indirect effect of cost-sharing on the utilization of a preventive service is given by:

$$\eta IDE_{sip} = \Delta Pr[S_{sip} = 1] / \Delta IDECS_{ip} / Pr[S_{sip} = 1] = (\Delta \Phi[\wedge S^*] / \Delta OV^* \times \Delta OV^* / \Delta CS) / \Phi[\wedge S^*].$$

2. The rates of preventive services utilization from CCHRI are not comparable to those reported from the HPVC for several reasons. The HPVC rates represent utilization for a random sample of employees, ages 18–64 years, of the large employers participating in PBGH. The CCHRI rates represent utilization for a random sample of all HMO members in California over 18, including those enrolled through Medicare (over 65), Medicaid, individual policies, and employers of all sizes.

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